CALCULATION			WELL VC	LUMES	
acility Name	USEPA Permit Nun	1	State Permit Number	si.	Well Class
_anphar 1-12	MI-125-2R-0030 32168 State [County [Analyst				2R
	Michigan	Oakland	A. Miller		
_anphar 1-12 Operator	Township	Range	ection Analysis Date		
Energex Petroleim Corp	5N	11E	12	August 20, 2015	
Geological Information				Information	
Name of Lowermost USDW	Base of USDWs, ft	Total Depth, ft	Top of Perfs, ft		
Glacial Drift -ormations in Inj. Zone	362. Top of Inj. Zone, ft	Packer Depth #	4156 Packer Depth OK?		
Niagaran Geulph	3988	4050	YES		
		ELL CONS		<u> </u>	
	I		ASING STRIN		
····		Surface Casing		Long String	
Top of Casing		0	Casing 3	COING SURING	0
Bottom of Casing		567	2532	4305	1 11
Well Bore Diameter		15	11	7.875	
Outside Diameter of Casing		11.75	8.625	5.5	
Weight per Foot of Casing		38		15.5	
1st Stage Cement		<b>30</b>	20	35.5	
Cu Ft to Fill Annulus in Open Hole		222.6	500 4	200.0	
Cu Ft to Fill Annulus in Open Hole Cu Ft to Fill Annulus in Cased Hole		322.6	599.4 154.4	368.6 508.7	
		550			
Cement/Epoxy Used Average Yield		550 1.18	200 1.18	150 1.18	-
Top of Cement in Annulus		0	1758	3380	
· · · · · · · · · · · · · · · · · · ·	elieliji De Pilotiji kalpyratora.	Theresial qualification (treesial)	1736	<del></del>	<u> </u>
2nd Stage Cement		plopoleja 24. spoločio		(per bond log	3)
Depth of DV Tool					
Cu Ft to Fill Annulus in Open Hole					
Cu Ft to Fill Annulus in Cased Hole					
Sacks of Cement Used					
Average Yield					
Top of Cement in Annulus					
3rd Stage Cement	- 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2		-Serigija Haltançkindi.		
Depth of DV Tool	PRINCES OF SECURIO				
Cu Ft to Fill Annulus in Open Hole					
Cu Ft to Fill Annulus in Cased Hole		1			
Sacks of Cement Used	30.58 350A 0.00 mil				
Average Yield	property improved the Miles of				
Top of Cement in Annulus					
Meets Standards for Surface Casing		YES	NO-cement	NO-cement	
Meets Standards for Any Casing		YES	YES	YES	
Meets Standards for Protection Casi	ng	NO-casing	NO-casing	YES	



acility Name	USEPA Permit Number State Permit Number		er	Well Class		
Lanphar 2-12 Well Name		32366			producer	
l l	<sub>State</sub> Michigan	County Oakland		Analyst A. Miller		
Operator	Township	Range	Section	Analysis Date	1	
	5N	11E	12	September 3	, 2015	
Geological Information		Completion Information				
	Base of USDWs, ft	i	Top of Perfs, ft			
Glacial Drift	362 Top of Inj. Zone, ft	4425 Packer Depth ff	Packer Depth OK?			
Niagaran Geulph	4220	Tacker Deptit, it	Lacker Depart Oft			
		ELL CONS	TRUCTION	J	<u> </u>	
			ASING STRIN		d	
S	Surface Casin	Casing 2	Long String			
Top of Casing		0	0	0	0	
Bottom of Casing	496	2552	4411			
Well Bore Diameter	13.75	10.625	7.5	12.5		
Outside Diameter of Casing	11.75	8.625	5.5			
Weight per Foot of Casing	38	20	15.5		141.0	
1st Stage Cement						
Cu Ft to Fill Annulus in Open Hole	165.6	518.1	316.3			
Cu Ft to Fill Annulus in Cased Hole		135.0	512.7			
Cement/Epoxy Used	300	175	175			
Average Yield	1.18	1.18	1.18			
Top of Cement in Annulus	0	1732	3198			
2nd Stage Cement						
Depth of DV Tool						
Cu Ft to Fill Annulus in Open Hole						
Cu Ft to Fill Annulus in Cased Hole						
Sacks of Cement Used						
Average Yield						
Top of Cement in Annulus	and the second second				*	
3rd Stage Cement						
Depth of DV Tool						
Cu Ft to Fill Annulus in Open Hole	s eteropeá satur da .					
Cu Ft to Fill Annulus in Cased Hole						
Sacks of Cement Used						
Average Yield						
Top of Cement in Annulus						
Meets Standards for Surface Casing	YES	NO-cement	NO-cement			
Meets Standards for Any Casing	YES	YES	YES			
Meets Standards for Protection Casil	NO-casing	YES				

CALCULATION (	USEPA Permit Nun		State Permit Number		Welt Class
•	39257			producer	
Lanphar 7-12 Veli Name	State	County	00201	Analyst	(p. cocco
AOR WELL	Michigan	Oakland		A. Miller	
Operator -	Township 5N	Range 11E	Section 12	Analysis Date	:
Geological Information		Completion In		September 3, 2015	
	Base of USDWs, ft	Total Depth fi	Top of Perfs, ft	Imormation	r
Glacial Drift	362	4355	4090		
ormations in Ing. Zone	Top of Inj. Zone, ft		Packer Depth OK?		
Niagaran Geulph	3988				
EVALUA	TION OF W	ELL CONS	TRUCTION	V	
THE PROPERTY OF THE PROPERTY O	Street West Van Der Street Van St	C.	ASING STRIN	<b>V</b> G	TO THE
5	Surface Casin	Casing 2	Long String		
Top of Casing	umija <b>g</b> rvikir.	0	0	0	0
Bottom of Casing	497	2571	4390		
Well Bore Diameter	13.75	10.625	7.5		
Outside Diameter of Casing	11.57	8.625	5.5		
Weight per Foot of Casing	42	24			
1st Stage Cement				ranga (Santa Laure Laure) Lauren (Santa Laure)	
Cu Ft to Fill Annulus in Open Hole	179.5	522.6	309.5		
Cu Ft to Fill Annulus in Cased Hole		-201.7	494.9		
Cement/Epoxy Used	310	200	250		
Average Yield	1.18	1.18	1.18		
Top of Cement in Annulus	0	1634	2656	<u> </u>	
2nd Stage Cement					
Depth of DV Tool				1	8 . 00.000.0000.0000.000
Cu Ft to Fill Annulus in Open Hole		4	1	<u> </u>	
Cu Ft to Fill Annulus in Cased Hole					
Sacks of Cement Used					<del>                                     </del>
Average Yield		8 3 5	<del></del>		
Top of Cement in Annulus	salengeraal tripik	4 4			1
3rd Stage Cement					
Depth of DV Tool		A Chicago Laboration		Comments of the state of the st	
Cu Ft to Fill Annulus in Open Hole			<u> </u>		<u> </u>
Cu Ft to Fill Annulus in Cased Hole					
Sacks of Cement Used					
Average Yield			<del> </del>	<del> </del>	+
Top of Cement in Annulus					<del> </del>
Meets Standards for Surface Casing	YES	NO-cement	NO-cement	-	
Meets Standards for Any Casing	YES	YES YES			<del>                                     </del>
Meets Standards for Protection Casi		NO-casing	YES YES		-
Comments	119	ivo-casing	) IEO		1
Comments in this cell					

CALCULATION OF \	WELL-SPECIFIC	PRESSURE EFI	FECTS	
Facility Name		Operator		
Lanphar 1-12	Energex Petroleim Corp			
Well Name	USEPA Permit Number	State Permit Number		
Lanphar 1-12	MI-125-2R-0030			
County	State	Well Class	Analyst	
Oakland	Michigan	2R	A. Miller	
Township	Range	Section	Date	
5N	11E	12 13-Jul-16		
JUSTIFICAT	TION FOR FRACTU	RE GRADIENT		
Administrative Basis for Fracture Gradient Code of Federal Regulatiions § 147	.1152(b)		Field Name	
Site-specific Testing Basis for Fracture Gradient				
Source of Fracture Gradient	Test Date	Fracture Gradient		
default			0.80	
MAXIMUM INJECTION PRESSURE		PRESSURE LOS	SS TO FRICTION	
Fracture gradient, psi/ft	Type of Fluid, liquid or gas	Maximum Injection Rate, gpm	Viscosity of injectate, cp.	
Fracture gradient, psi/ft 0.80	Type of Fluid, liquid or gas		0.0	
0.80	gas	0 Diameter of the Tubing, in.		
0.80 Top of Inj. Zone, ft 3988	■ 취임되었다 가 된 = 경취된	0 Diameter of the Tubing, in.	0.0 Average velocity of injection, ft/sec	
0.80 Top of Inj. Zone, ft 3988 Specific Gravity	gas	0 Diameter of the Tubing, in.	0.0 Average velocity of	
0.80  Top of Inj. Zone, ft 3988  Specific Gravity 0.765	gas	Diameter of the Tubing, in.  0.000  Weight of Tubing, lbs/ft  0.000	O.O  Average velocity of injection, ft/sec  Reynolds Number	
0.80  Top of Inj. Zone, ft 3988  Specific Gravity 0.765  Safety factor	gas	Diameter of the Tubing, in.  0.000  Weight of Tubing, lbs/ft	0.0 Average velocity of injection, ft/sec	
0.80  Top of Inj. Zone, ft 3988  Specific Gravity 0.765	gas 100 Maximum Injection	Diameter of the Tubing, in.  0.000 Weight of Tubing, lbs/ft  0.000 Internal Diameter of	O.0  Average velocity of injection, ft/sec  Reynolds Number	
0.80  Top of Inj. Zone, ft 3988  Specific Gravity 0.765  Safety factor 0.05	gas  100  Maximum Injection Pressure, psi	ppm  O  Diameter of the Tubing, in.  0.000  Weight of Tubing, lbs/ft  0.000  Internal Diameter of Tubing, ins  0.000	O.O  Average velocity of injection, ft/sec  Reynolds Number  Total Friction Loss, psi	
0.80  Top of Inj. Zone, ft  3988  Specific Gravity  0.765  Safety factor  0.05	gas  100  Maximum Injection Pressure, psi 2866	ppm  O  Diameter of the Tubing, in.  0.000  Weight of Tubing, lbs/ft  0.000  Internal Diameter of Tubing, ins  0.000  PRESSURE CHANGE  Total Volume of Annulus, gals	O.O  Average velocity of injection, ft/sec  Reynolds Number  Total Friction Loss, psi	
0.80  Top of Inj. Zone, ft 3988  Specific Gravity 0.765  Safety factor  0.05  INFORMATION F  Total Volume of Well (tubing and Open Hole), gals	gas  100  Maximum Injection Pressure, psi 2866	ppm 0 Diameter of the Tubing, in. 0.000 Weight of Tubing, lbs/ft 0.000 Internal Diameter of Tubing, ins 0.000 PRESSURE CHANGE Total Volume of Annulus, gals	O.O  Average velocity of injection, ft/sec  Reynolds Number  Total Friction Loss, psi	

For gas injection, the maximum allowable injection pressure was calculated in accordance with the UIC Branch Standard Operating Procedure for Calculating Maximum Injection Pressure, SOP-WD-UIC-24, May 2010, using the formula below:

> 3.8 For wells injecting gas in a gaseous state (not compressed to a liquid or supercritical), use the following equation (Rawlins and Schellhardt, 1936):

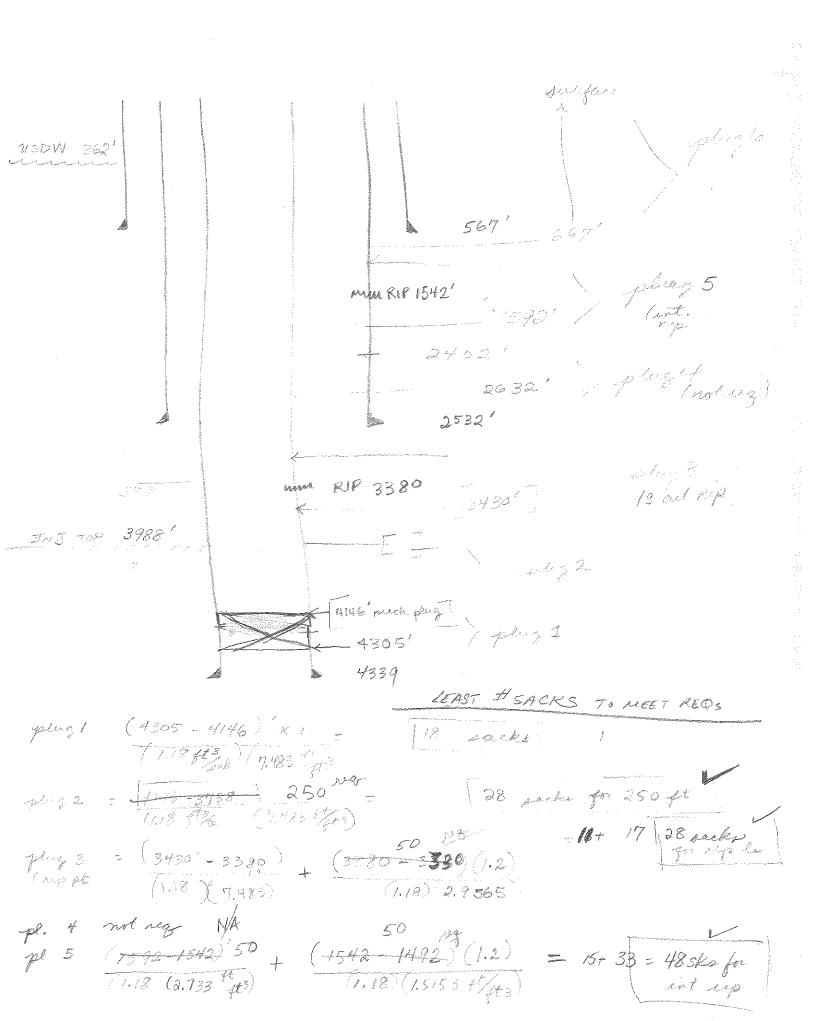
$$MIP = FG \times D_{ET} \times e^{-\left(\frac{SG \times D_{ET}}{33.34 \times (460 + T)}\right)} - 14.7$$

Eq. 13

Where:

where:
SG = Specific Gravity of the gas (dimensionless, air = 1.00)
T = Average temperature in the wellbore (°F)
FG = fracture gradient
D = depth

			:			
•						
			· .			
·						
		·			,	



plug 6 (67-0) ft (1475 typ3) = \383 sks for USDW- surface

calculated lead to	acks.	# Solls is plans
plug 2 plug 2 plug 3	18 28 28	50 V 32 V 60 V
plug 4 (NOT REQ.) plug 5	48	100 V
plug 6	383	404 /

plan cement sacks.

excuse Cale.

required genent sts